PRACTICAL EXERCISE - Fuzzy-Control

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1. INTRODUCTION

This is an approach to teach the Fuzzy theories in a practical way, without a lot of paper and formulas. On behalf of a Siemens Demo Software, a Fuzzy controller will be shown and worked out empirically.

The goal of this exercise is to get a basic idea about

What is Fuzzy-Control

How does it work

There is a diskette included for every participant. Please take this diskette home as an example that you can recall anytime, whenever you are in a position to work with fuzzy-logic or explain to someone else what fuzzy is really about.

The task of this exercise is:

To set-up a temperature controller which uses a room and an outside temperature signal thus actuating a heater and an air-conditioner.
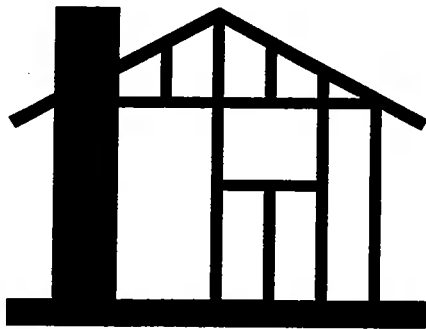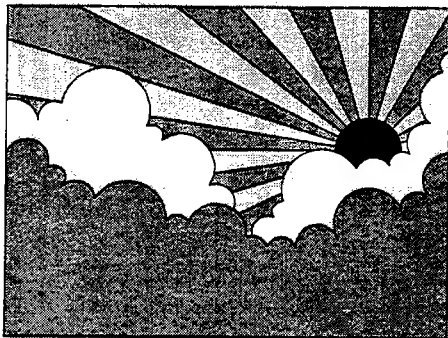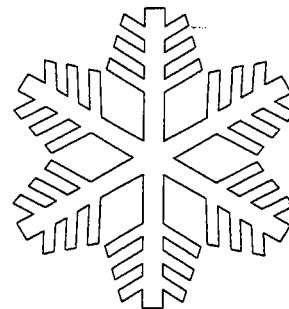
Room Temperature

Controller

Heater

Outside Temperature

Air Conditioner

2. EXERCISE

2.1 Start / Set-up

♦ Start Fuzzy.exe

♦ Create new Project with the name "TEMPCON" ("File" "New...") with 2 Inputs and 2 Outputs.

♦ Assign names to inputs and outputs (see pictures in 1. Introduction)

♦ Define 3 temperature ranges (membership functions) for room temp (e.g. chilli, comfortable, warm).

♦ Define 3 temperature ranges for outside temp (e.g. cold, warm, hot).

♦ Define 4 ranges for the heater (e.g. off, low, high, on) and 3 ranges for the air conditioner (e.g. off, med, on).

♦ Adjust the temperature scale to reasonable values (e.g. room temp. from 10...30°C).

2.2 Input/output Fuzzyfication

Perform the Fuzzification of the 2 inputs and 2 outputs by asking the following questions and set the curves accordingly:

... where is 0% cold...

... from where to where is 100% warm...

Out of 100 people, how many people would say that is chilli (first curve) at what temperature. Do the same for the other 2 curves. The number of people (in %) which is actually the degree of fulfilment (or the percentage of truth) is on the vertical axis, the temperature on the horizontal axis.

On the example in the next picture below, it is 50% chilli (50 out of 100 people would call it chilli) at 20.5°C and after 22°C it is not chilly anymore.
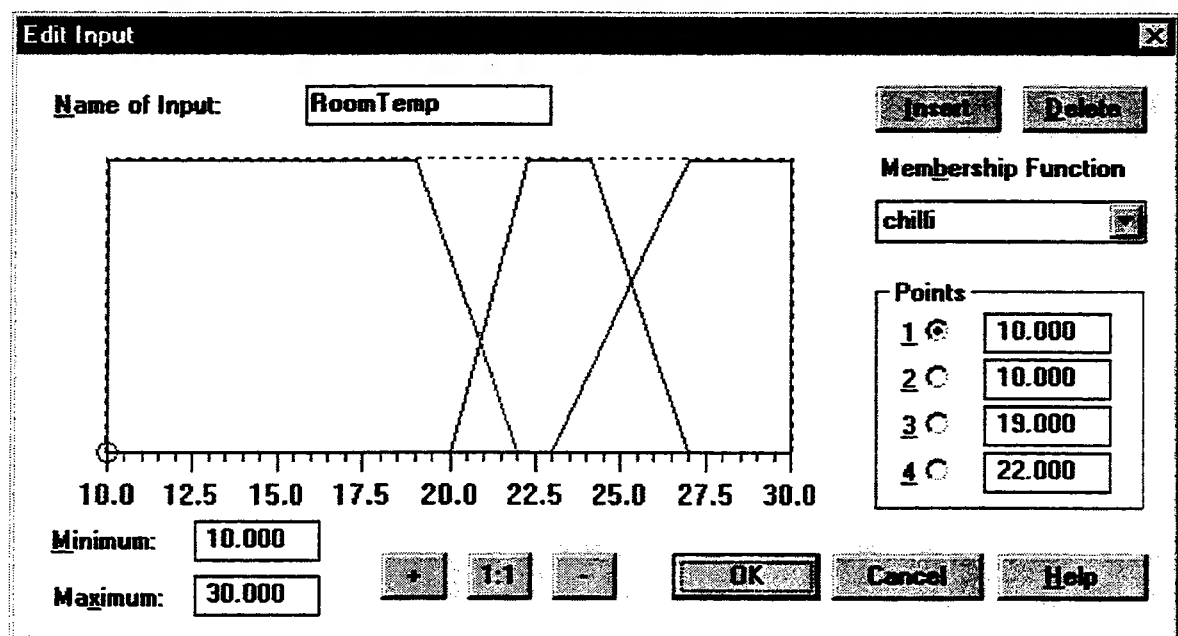
2.3 Implementing rules

Now fill in the rules in "If...then".
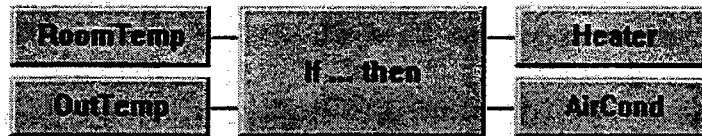
2.4 Testing

Use the menu "View" to simulate input values as constants or curves (sub menu "Curve Parameters...") and test the controller (sub menu "Curve Recorder").

2.5 Save

Save your project ("File" "Save" or "File" "Save As...").

For those who could not work through the exercise, there is an example of this exercise on the diskette, named exercise.txt. Rename it to *.fpl to be able to call it from the demo software.

3. MISCELLANEOUS

On the Cement Course CD-Rom, the directory \MISC\FUZZY contains all files and information being used for the practical work of fuzzy control logic described in the chapters above. Below a list of all files of the directory \MISC\FUZZY

Files	Description
FUZZY.EXE	program file for the Fuzzy demo
FUZZY.ICO	icon for the above file
README.TXT	supplementary supplier information about the fuzzy package
SHUTTERS.FPL	example "shutters controller"
PENDULUM.FPL	example "inverse pendulum"
EXERCISE.TXT	example "temperature control"
S7FUZ1EF.PPT	Power Point slides about the fuzzy package